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Phonon anomaly in $Bi_2Sr_2CaCu_2O_{8+\delta}$* JIANDONG GUO, HUAJUN QIN, KEHUI WU, Institute of Physics, Chinese Academy of Sciences, Beijing 100080, China, R. G. MOORE, E. W. PLUMMER, University of Tennessee, Knoxville, TN 37996, J. WEN, G. D. GU, Brookhaven National Lab, Upton, NY 11973, JIANDI ZHANG, Florida International University, Miami, FL 33199
— Electron-phonon coupling (EPC) plays in many exotic phenomena displayed by strongly-correlated electron materials, such as the pairing mechanism in high-T_C superconductors and metal-insulator transition in ruthenates. Many studies show a strong renormalization of quasi-particle band structure near Fermi energy associated with the coupling to boson modes ∼40-50 meV. However, there is no clear picture of the origin of these modes. With angle-resolved electron energy loss spectroscopy, we have studied the lattice dynamics of $Bi_2Sr_2CaCu_2O_{8+\delta}$ surface. The data indicate a phonon anomaly of modes ∼50 meV, identified as the in-plane Cu-O stretching modes, where the energy shifts (softens) while the spectral linewidth and weight vary along (0,0)-(π,0) direction. The other feature ∼80 meV, attributed to apical oxygen vibrations, exhibits distinct dispersion toward (π,π). Such behaviors are observed both above and below the superconducting T_C. These detailed measurements provide new insights into the nature of EPC in such materials. * Supported by China NSF-10704084, NSF DMR-0346826, NSF and DOE (NSF-DMR-0451163 and DMS&E).

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